Remarks

The Office Action mailed April 21, 2005 has been carefully considered. After such consideration, claims 2 and 4 have been amended. Claims 1-2, 4, 7-8, and 10-11 remain in the case with none of the claims being allowed.

The Office Action rejected claims 2 and 4 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, the examiner stated that there was no proper antecedent basis for "vegetable fiber" in claims 2 and 4. Those claims have been amended to teach the use of envelopes of corn grains as in claim 1.

The Office Action rejected claims 1-2, 4, 7, and 10-11, under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,831,127 to Weibel, Vovlas et al. Revue. Nematol. (1985), Vol. 8 (2), pages 125-130 (Vovlas), and U.S. Patent No. 4,752,579 to Arena et al.

The Office Action also rejected claim 8 under 35 U.S.C. 103(a) as being unpatentable over Weibel in view of Vovlas et al. and Arena et al. as applied to claims 1-2, 4, 7, and 10-11, and further in view of Gatzi et al. Hel. Chim. Acta. (1938), Vol. 21, pages 195-205. The examiner says Gatzi teaches the catalytic hydrogenation of L-arabinose using Raney Ni and H2 to produce L-arabitol. The examiner also says it would have been obvious to produce L-arabitol by hydrogenating a solution containing L-arabinose since such method is expressly taught in the prior art, and that the method by which L-arabinose was produced does not render the instant method for producing L-arabitol unobvious.

As the examiner is aware, it is the burden of the examiner to establish a prima facie case of obviousness when rejecting claims under 35 U.S.C. 103 (In re Reuter, 651 F. 2d. 751. 210 U.S.P.Q. 249 (CCPA 1981)). In this case, the applicant respectfully submits that the examiner has failed to establish a prima facie case of obviousness.

It has been repeatedly held by the Court of Appeals for the Federal Circuit, that absent some teaching, suggestion, or incentive supporting a combination of references, obviousness cannot be established by combining the teachings of the prior art (ACS Hospital Systems, Inc. v. Montefiori Hospital, 732 F.2d. 1572, 1577, 221 U.S.P.Q. 929, 939 (CAFC 1984)). This has been interpreted to mean that there must be a reasonable intrinsic or extrinsic justification for the proposed combination of references in order to properly reject the claims of an

invention. The examiner must propose some logical reason apparent from the evidence of record that justifies his combination or modification of the references (In re Regel, 188 U.S.P.Q. 132 (CCPA 1975)). Therefore, it is important in the instant situation to examine whether or not there exists a reasonable intrinsic or extrinsic justification for the proposed combination of references.

Prior to the present invention, the following five points have been known in the art:

(1) Plant cell walls consist of cellulose and/or hemicellulose;

(2) Hemicellulose is easier to be degraded compared to cellulose;

(3) Constitutive sugar of hemicellulose is various depending on the kind of plant species. Plant cell walls of some plant species contain L-arabinose as most the dominant constitutive sugar. Plant cell walls of other plant species contain sugars other than L-arabinose (i.e. D-xylose) as the most dominant constitutive sugar;

(4) When hemicellulose is degraded with acid, the most dominant component of the constitutive sugar will be produced in the largest amount (if L-arabinose is most dominant constitutive sugar, L-arabinose will be produced in the largest amount. Likewise, if D-xylose is the most dominant component, D-xylose will be produced in the largest amount); and

(5) If one restricts the composition to be degraded and produced, yield will be suppressed to a low level.

Points 1 and 3 are widely known as scientific facts. Vovlas et al. provides support for point 1. Support for points 1 and 3 is also found in "Analysis of Pectin Structure by HPAED-PAD," Hotchkiss et al., (1996), "The Carbohydrate Composition of Corn Cob Hemicelluloses," by Donnelly et al., (1973), and "Neutral Monosaccharide Composition of Various Fibrous Substrates: A Comparison of Hydrolytic Procedures and Use of Anion-Exchange High-Performance Liquid Chromatography with Pulsed Amperometric Detection of Monosaccharides," by Garleb et al. (1989), copies of which are attached hereto.

As to point 3, "End-products of Enzymatic saccharification of Beet Pulp, with a Special Attention to Feruloylated Oligosaccharides" by Micard et al. (1996) provides support

for the notion that plant cell walls such as those found in beet pulp are L-arabinose rich (Please see column "soluble material" in table 1 for components derived from hemicellulose). Additionally, "Isolation and Partial Characterization of Feruloylated Oligosaccharides from Maize Bran" by Saulnier et al. (1994) provides support for the idea that plant cell walls such as in corn fiber are D-xylose-rich. (Please see Table 3)

Point 2 lays out the phenomenon which has been scientifically reported in "Determination of Carbohydrates in Foods" by D.A.T. Southgate (1969) and "Determination of the Non-Starch Polysaccharides in Plant Foods by Gas-Liquid Chromatography" by Wiggins et al. (1982). The method of Arena et al. is based on this phenomenon. In the Arena et al. patent, the production of D-glucose is suppressed by suppressing the degradation of cellulose, not by selectively degrading the constitutive sugar of hemicellulose.

As to point 4, the same is self-explanatory. The result in Schiweck et al. agrees with point 4.

Point 5 is demonstrated by Arena et al. In Arena et al., when one takes out constitutive sugars in hemicellulose, one must select one of the two following strategies: 1) to perform strong degradation so as to take out most predominant component of the constitutive sugar; or 2) to perform weak degradation so as to selectively take out any desirable constitutive sugar while suffering from low yield.

According to the present invention, selective production of constitutive sugar of hemicellulose is possible without suppressing the yield, which is contrary to the above five points known in the art.

In the present invention, the raw material is restricted to envelopes of corn grains. As shown in Saulnier et al., (See Result and Discussion section and Table 1), destarched brans (destarched envelopes of corn) are composed of 16.8% arabinose, 30.9% xylose,..., and thus heteroxylans represent approximately 60% of the material. Therefore, in envelopes of corn, L-arabinose is not the most dominant constitutive sugar of hemicellulose. That is, the present invention enables selective production of L-arabinose, which is not the most dominant constitutive sugar of hemicellulose in envelopes of corn from envelopes of corn without suppressing the yield (the solubilizing rate is 30% or more). Thus, the present invention clearly involves inventive steps over the prior art.

Weibel teaches a method for the production of biopolymers derived from hemicellulose or cellulose. Weibel states that one object of the invention is to produce mixture of biopolymers derived from cellulose (cellulosic material) with biopolymer derived from hemicellulose (hemicellulosic material) (Column 4, lines 19-51). Judging from the composition of the solution produced in Example 1 of Weibel (Column 14, lines 28-37), the most dominant component of the constitutive sugar of the raw material (sugar beet pulp) used in Weibel is L-arabinose. Weibel discloses that the yield of L-arabinose increases under certain conditions (Column 17, lines 28-54), but this disclosure merely demonstrates the above-referenced point 4. The Examiner deems that the condition shown in Weibel is a mild acid condition (the yield of L-arabinose increases at 0.09N), but in terms of the temperature (165°C), the condition shown in Weibel is severe.

Arena et al. teaches the production of sugar components derived from hemicellulose from corn kernel hulls. Arena et al. discloses extracting a sugar derived from hemicellulse (D-xylose and L-arabinose) separately and selectively from sugar derived from cellulose (D-glucose). However, Arena et al. never teaches manufacturing L-arabinose separately from D-xylose, both of which are sugars derived from hemicellulose. Arena et al. teaches selectively liberating L-arabinose by performing hydrolysis under very mild condition of 60°C (Column 5, Table 1). However, at 60°C the solubilizing rate of raw material is only 23.2% (3.3+8.3+11.6=23.2). At 70°C or higher, the solubilizing rate increases 37% or more, but selective production of L-arabinose is not achieved. Thus, according to the method of Arena et al., selective production of L-arabinose and high yields of soluble components are not realized at the same time.

Weibel teaches a technique to perform strong degradation so as to take out major components in a large amount, while Arena et al. teaches a technique to perform mild degradation so as to take out minor components with suppression of the yield. Thus, the techniques or Weibel and Arena et al. are completely contrary to one another. Therefore, those skilled in the art would not be motivated to combine the two techniques. If combined, one would obtain, for example, a method for producing D-xylose from corn kernel hulls.

This argument is also applicable to claim 8. By this amendment the Applicant has placed the case in condition for immediate allowance and such action is respectfully

requested. However, if any issue remains unresolved, Applicant's attorney would welcome the opportunity for a telephone interview to expedite allowance and issue.

Respectfully submitted,

Howard A. MacCord, Jr.
Registration No. 28,639
MacCord Mason PLLC
P. O. Box 2974
Greensboro, NC 27402
(336) 273-4422

Date: July 19, 2005
File No.: 4629-007

ENCLOSURES

CERTIFICATE OF MAILING

I HEREBY CERTIFY THAT THIS DOCUMENT IS BEING DEPOSITED WITH THE UNITED STATES POSTAL SERVICE AS FIRST-CLASS MAIL, IN AN ENVELOPE ADDRESSED TO: **COMMISSIONER FOR PATENTS, P.O. BOX 1450, ALEXANDRIA, VA 22313-1450**, ON July 19, 2005
(Date of Deposit)

Christian E. Carter-Seyboth
Name of Depositor

Christian E. Carter-Seyboth
Signature

July 19, 2005
Date of Signature